

EXHIBIT K

LITHIUMHUB’S INFRINGEMENT ANALYSIS

U.S. Patent No. 9,412,994 – Tracker Lithium Gen2 TLi52-DC

Independent Claims 1 and 14


LithiumHub provides evidence of infringement of at least independent claims 1 and 14 of U.S. Patent No. 9,412,994 (hereinafter “the ’994 patent”) by Defendant. In support thereof, LithiumHub provides the following claim charts.


“Accused Products” as used herein refers to at least Tracker Lithium Gen2 TLi52-DC and the Accused Products enumerated in the Complaint. These claim charts demonstrate Defendant’s infringement by comparing each element of the asserted claims to corresponding components, aspects, and/or features of the Accused Products. These claim charts are not intended to constitute an expert report on infringement. These claim charts include information provided by way of example, and not by way of limitation.


Unless otherwise noted, LithiumHub contends that Defendant indirectly infringes the ’994 patent in violation of 35 U.S.C. § 271(a) by inducing others to sell, offer to sell, make, use, and/or import the Accused Products. The following exemplary analysis demonstrates that infringement. Unless otherwise noted, LithiumHub further contends that the evidence below supports a finding of indirect infringement under 35 U.S.C. §§ 271(b) and/or (c), in conjunction with other evidence of liability under one or more of those subsections. Defendant makes, uses, sells, imports, or offers for sale in the United States, or has made, used, sold, imported, or offered for sale in the past, without authority, or induces others to make, use, sell, import, or offer for sale in the United States, or has induced others to make, use, sell, import, or offer for sale in the past, without authority products, equipment, or services that infringe claims 1 and 14 of the ’994 patent, including without limitation, the Accused Products.

Unless otherwise noted, LithiumHub believes and contends that each element of each claim asserted herein is literally met by the Accused Products. However, to the extent that Defendant attempts to allege that any asserted claim element is not literally met, LithiumHub believes and contends that such elements are met under the doctrine of equivalents. More specifically, in its investigation and analysis of the Accused Products, LithiumHub did not identify any substantial differences between the elements of the patent claims and the corresponding features of the Accused Products, as set forth herein. In each instance, the identified feature of the Accused Products performs at least substantially the same function in substantially the same way to achieve substantially the same result as the corresponding claim element.

To the extent the chart of an asserted claim relies on evidence about certain specifically identified Accused Products, LithiumHub asserts that, on information and belief, any similarly functioning Accused Product also infringes the charted claim. LithiumHub reserves the right to amend this infringement analysis based on other products made, used, sold, imported, or offered for sale by Defendant or its customers. LithiumHub further reserves the right to amend this infringement analysis by adding, subtracting, or otherwise modifying content in the “Accused Products” column of each chart.

| US9,412,994 Claim Element | Tracker (Tracker Lithium Gen2 12.8V 52AH) | | | | | | | | |
|--|---|----------------------|-----------|----------------------|-------------|----------------------|-------------|------------------------|-----------|
| Claim 1 | | | | | | | | | |
| <p>[1p] A battery pack for driving an electrical device in a 12 volt to 120 volt operating system, said battery pack having a positive terminal and a negative terminal, comprising:</p> | <p>To the extent the preamble is limiting, the Tracker Lithium Gen2 12.8V 52AH is a battery pack for driving an electrical device in a 12 volt to 120 volt operating system.</p>  <p>SIZING/SELECTION</p> <p>Q: Will Tracker Lithium batteries work with my Trolling motor? Tracker Lithium deep-cycle batteries 52A and greater are designed to work with all production Trolling Motors. Please consult your specification sheet for larger current drains.</p> <p>Q: What is the minimum quantity of batteries needed for my trolling motor or boat motor?</p> <table border="1"> <tbody> <tr> <td>• 12V trolling motor</td> <td>1 battery</td> </tr> <tr> <td>• 24V trolling motor</td> <td>2 batteries</td> </tr> <tr> <td>• 36V trolling motor</td> <td>3 batteries</td> </tr> <tr> <td>• 12V Starting Battery</td> <td>1 battery</td> </tr> </tbody> </table> <p>Q: Do I need to use the Lithium Starting battery if I purchase Lithium deep-cycle batteries? No, but we recommend the Tracker Lithium starting batteries for extended accessory runtime and faster charging than lead batteries.</p> <p>Q: Can I use different types (Flooded, AGM, Lithium) batteries in my boat for Deep-Cycle applications? Yes, if there is a defective lithium unit, then adding a Flooded or AGM battery short-term in the battery bank will not cause any damage to either setup, but you cannot mix Lithium and Lead in series connections for long-term use. Also, ensure you use the same SKU battery per bank.</p> <p>Q: Can I use different types (Flooded, AGM, Lithium) batteries in starting applications. Yes, adding a flooded or AGM (Lead) battery in parallel can protect the lithium battery and boat components from momentary/defective peak alternator current & voltage.</p> <p><i>Please note: The lead battery should connect to the lithium battery in parallel as a stand-alone battery. Then, install the lithium battery as the main battery with all wires, charger, alternator, starter, etc.... connected to the lithium battery terminals. (See series and parallel diagram on page 2)</i></p> <p>Q: Are my Tracker Lithium batteries drop-in replacements? Yes, Tracker Lithium batteries have physically similar dimensions as Lead and AGM.</p> <p>Deep-Cycle options: The 52A battery is in the U1 size (riding lawnmower size). The 60, 80, and 100 options are all group 24. Starting: The 100A starting battering is a group 31.</p> <p>INSTALLATION</p> <p>Q: How should I install my Tracker Lithium batteries? The battery is a direct replacement and should be installed the same as the existing batteries.</p> <p>INSTALLATION (cont'd)</p> <p>Q: What size cables/wiring do I need to connect the Tracker Lithium batteries? Refer to the Original Equipment Manufacturer's specifications for wire size required to operate your electrical components and motors.</p> <p>CHARGING</p> <p>Q: What charger do you recommend for marine applications? We recommend using a multi-bank charger to ensure each battery is balanced correctly and receives a full charge. Chargers with a lithium charge profile are required; Lead battery chargers may charge the lithium battery, but doing so will harm the lithium cells lifespan. Please consult your Tracker Lithium dealer for approved lithium charger models.</p> <p>Dual Pro and Noco Charging brands with lithium settings are the approved options for Tracker Lithium. There are there brands that state they can "charge" lithium, but there could be functionality concerns, such as not having to the ability to charge a battery that's 100% discharged. We will update this list with additional chargers as they become available.</p> <p>Q: Can I use any charge profile to charge my batteries? No, AGM or Lead charging profiles can charge a lithium battery which is not fully depleted, but it will harm lithium cells and reduce the battery's overall lifespan.</p> <p>Lithium chargers use algorithms that properly balance and charge the lithium cells.</p> <p>Q: Can I charge multiple batteries in series or parallel with a single set of charge leads (single-bank charger)? Yes, but each battery must receive a full charge independently before connecting in series or parallel. It is strongly recommended to use a multi-bank charger to ensure proper charging and wake-up functions.</p> <p>Q: How long does it take for the batteries to be fully charged? The charging time for your batteries depends on the following: the percent discharged, the charger's output current (Amps), and the total capacity of your battery. Typically, a 10A charger will fully charge a depleted 100A battery in 10 hours.</p> <p>Q: Do I need to charge my Tracker Lithium batteries after each use? It is recommended to fully charge your batteries after each use to ensure full capacity for subsequent uses. Storing lithium batteries under 20% charged can damage the cells or BMS which reduces their overall lifespan.</p> | • 12V trolling motor | 1 battery | • 24V trolling motor | 2 batteries | • 36V trolling motor | 3 batteries | • 12V Starting Battery | 1 battery |
| • 12V trolling motor | 1 battery | | | | | | | | |
| • 24V trolling motor | 2 batteries | | | | | | | | |
| • 36V trolling motor | 3 batteries | | | | | | | | |
| • 12V Starting Battery | 1 battery | | | | | | | | |

| US9,412,994 Claim Element | Tracker (Tracker Lithium Gen2 12.8V 52AH) |
|---------------------------|---|
| | <p data-bbox="535 139 1913 207">https://assets.basspro.com/image/upload/v1681327624/PDFs/other/other_Tracker_Lithium_Gen2_FAQ_Sheet.pdf (annotated).</p> <div data-bbox="535 240 1875 857">  <p>The left image shows the front of a green Tracker Lithium Gen2 12.8V 52AH battery. The label features the 'TRACKER LITHIUM' logo in large, stylized letters. Above the logo, it says 'Gen2: 12.8V 52AH'. To the right of the logo, it says 'BUILT WITH 100% CERTIFIED CLASS A LIFEPO4 LITHIUM CELLS' and 'LiFePO4'. Below the logo, it says 'SUPER HIGH OUTPUT LITHIUM DEEP CYCLE BATTERY'. At the bottom left, there are several certification logos including UN38.3, CE, and a lithium symbol. At the bottom right, it says 'with Precision Waterproofing, Vibration Control & Fire Suppression Technology'. The right image shows the back of the battery, revealing the internal cell structure. The label on the back also says 'Gen2: 12.8V 52AH' and 'TRACKER LITHIUM'. It also mentions 'BUILT WITH 100% CERTIFIED CLASS A LIFEPO4 LITHIUM CELLS' and 'LiFePO4'. At the bottom, it lists 'MODEL: TU52-DC', 'GROUP: U1', 'VOLTAGE: 12.8V', 'CAPACITY: 52Ah', and 'ENERGY: 665Wh'.</p> </div> <p data-bbox="535 898 1892 966">To the extent the preamble is limiting, the Tracker Lithium Gen2 12.8V 52AH has a positive terminal (10) and a negative terminal (11).</p> |

| US9,412,994 Claim Element | Tracker (Tracker Lithium Gen2 12.8V 52AH) |
|---|---|
| |  |
| <p>[1a] a battery pack housing having at least a first portion and a mating second portion;</p> | <p>The Tracker Lithium Gen2 12.8V 52AH has a battery pack housing (1) with a first portion (1A) and a mating second portion (1B).</p>  |


| US9,412,994 Claim Element | Tracker (Tracker Lithium Gen2 12.8V 52AH) |
|--|--|
| <p>[1b] at least one lithium-based rechargeable cell within said housing, each such cell having a positive pole and a negative pole;</p> | <p>The Tracker Lithium Gen2 12.8V 52AH comprises at least one lithium-based rechargeable cell within said housing.</p>  |

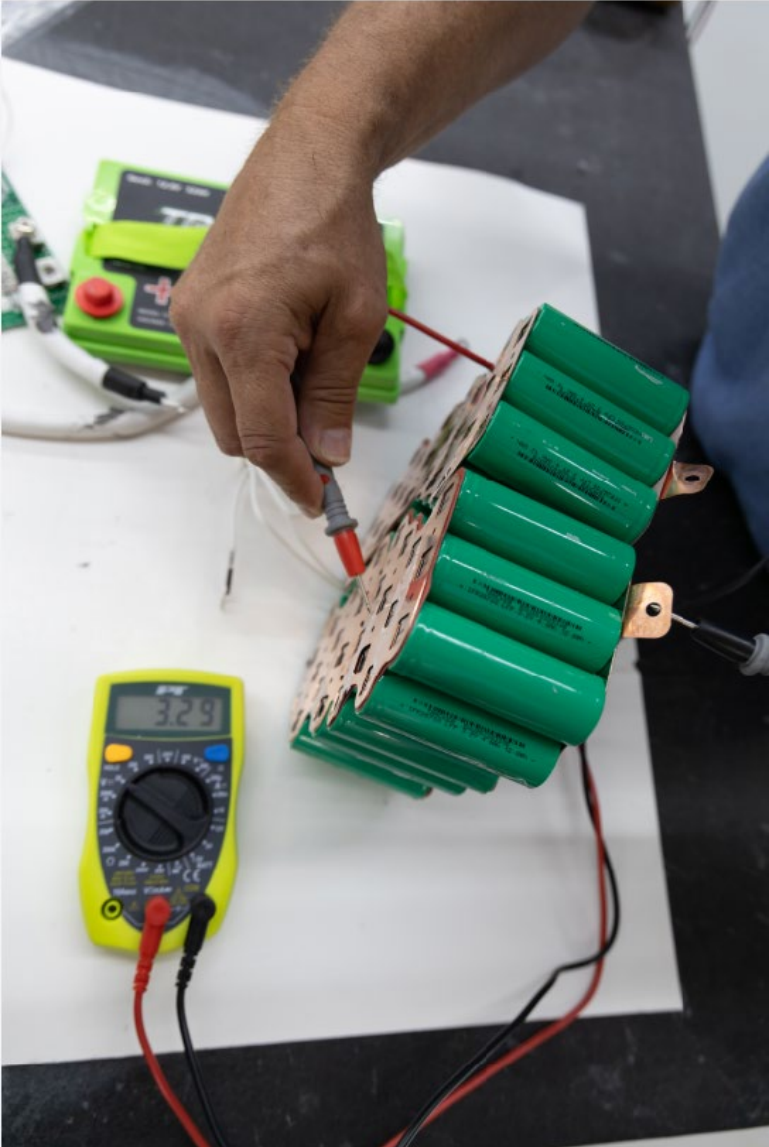
US9,412,994 Claim Element

Tracker (Tracker Lithium Gen2 12.8V 52AH)



Each such cell of the Tracker Lithium Gen2 12.8V 52AH has a positive pole and a negative pole.

| US9,412,994 Claim Element | Tracker (Tracker Lithium Gen2 12.8V 52AH) |
|---------------------------|--|
| | <div data-bbox="537 134 1549 602"></div> <p data-bbox="537 643 1898 748">Additionally, for example, the polarity of each unit in a cell of the Tracker Lithium Gen2 12.8V 52AH was demonstrated as having a positive pole and a negative pole by using a multimeter to measure a voltage potential across the positive pole and a negative pole of a cell.</p> |

| US9,412,994 Claim Element | Tracker (Tracker Lithium Gen2 12.8V 52AH) |
|--|--|
| |  |
| <p>[1c-i] a circuit board within said housing configured to balance each individual cell within said</p> | <p>The Tracker Lithium Gen2 12.8V 52AH comprises a circuit board (2) within said housing configured to balance (5) each individual cell within said housing (e.g., 5A-5D).</p> |

US9,412,994 Claim Element

housing, and having a cutoff function incorporated therein,

Tracker (Tracker Lithium Gen2 12.8V 52AH)


TLi/WR52-DC Gen2

ELECTRICAL SPECIFICATIONS

| | |
|---------------------------|------------------|
| Nominal Voltage | 12.8V |
| Nominal Capacity | 52Ah |
| Capacity @ 25A | 156 min |
| Resistance | ≤30 mΩ @ 50% SOC |
| Efficiency | 99% |
| Self Discharge | <3% per Month |
| Maximum Modules in Series | 4 |

DISCHARGE SPECIFICATIONS

| | |
|--------------------------------------|------------------------------------|
| Maximum Continuous Discharge Current | 60A |
| Peak Discharge Current | 200A (2s) |
| BMS Discharge Current Cut-Off | 200A ± 50A (2 ± 1 ms) |
| Recommended Low Voltage Disconnect | 10V |
| BMS Discharge Voltage Cut-Off | 9.2V (2.3 ± 0.1 vpc) (2 ± 0.5s) |
| Reconnect Voltage | 10V (2.5 ± 0.1 vpc) (2 ± 0.5s) |
| Short Circuit Protection | 200-800 μA |

TEMPERATURE SPECIFICATIONS

| | |
|------------------------------|-----------------------------|
| Discharge Temperature | -4 to 140 °F (-20 to 60 °C) |
| Charge Temperature | -4 to 113 °F (-20 to 45 °C) |
| Storage Temperature | 23 to 95 °F (-5 to 35 °C) |
| BMS High Temperature Cut-Off | 167 °F (75 °C) |
| Reconnect Temperature | 122 °F (50 °C) |

MECHANICAL SPECIFICATIONS

| | |
|------------------------|---|
| Dimensions (L x W x H) | 7.75 X 5.27 X 6.69" 197 X 134 X 170 MM |
| Weight | 15.7 lbs (7.1 kg) |
| Terminal Type | M8 x 1.25 x 2mm |
| Terminal Torque | 80 - 100 in-lbs (9 - 11 N-m) |
| Case Material | ABS |
| Enclosure Protection | IP67 |
| Cell Type - Chemistry | Cylindrical - LiFePO4 |

CHARGE SPECIFICATIONS

| | |
|--|--|
| Recommended Charge Current | 10A |
| Maximum Charge Current | 50A |
| Charge Current 14 to 32 °F (-10 to 0 °C) | ≤0.03 C |
| Charge Current -4 to 14 °F (-20 to -10 °C) | ≤0.02 C |
| Recommended Charge Voltage | 14.2 V - 14.6 V |
| BMS Charge Voltage Cut-Off | 15V (3.75 ± 0.05 vpc) (1.5 ± 1.0 s) |
| Reconnect Voltage | 14.4V (3.6 ± 0.05 vpc) |
| Balancing Voltage | 14.2V (3.55 ± 0.05 vpc) |

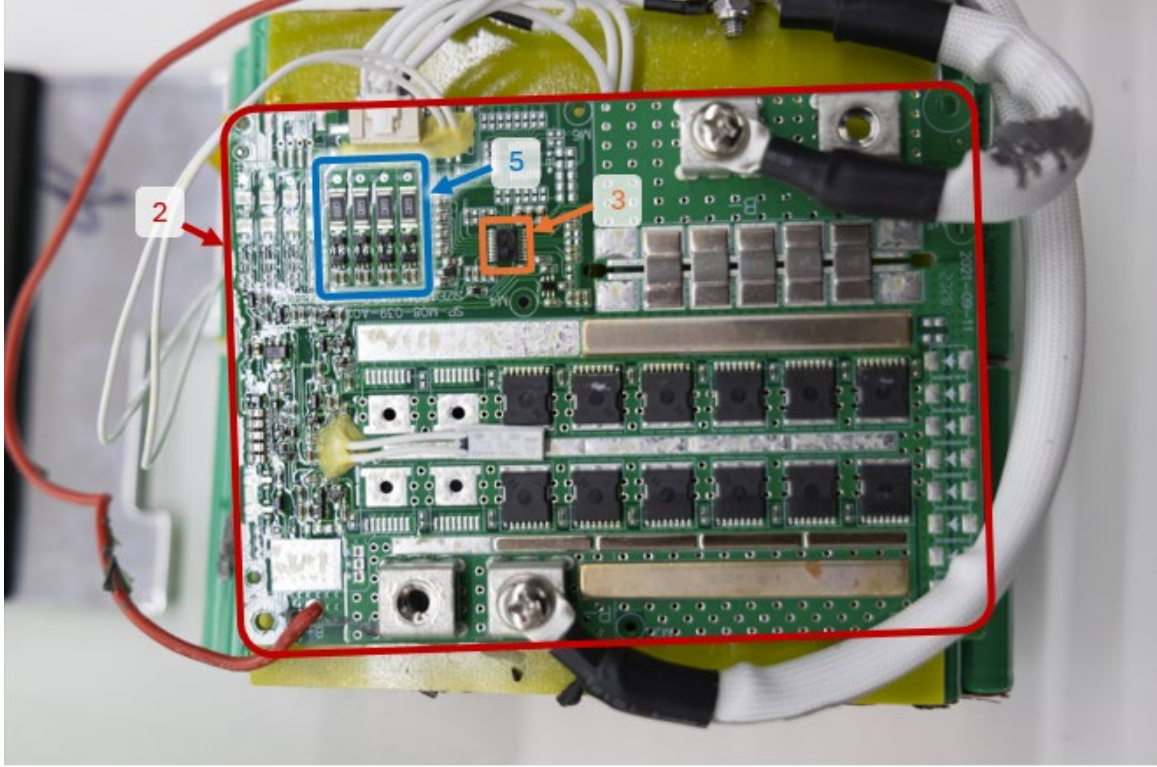
COMPLIANCE SPECIFICATIONS

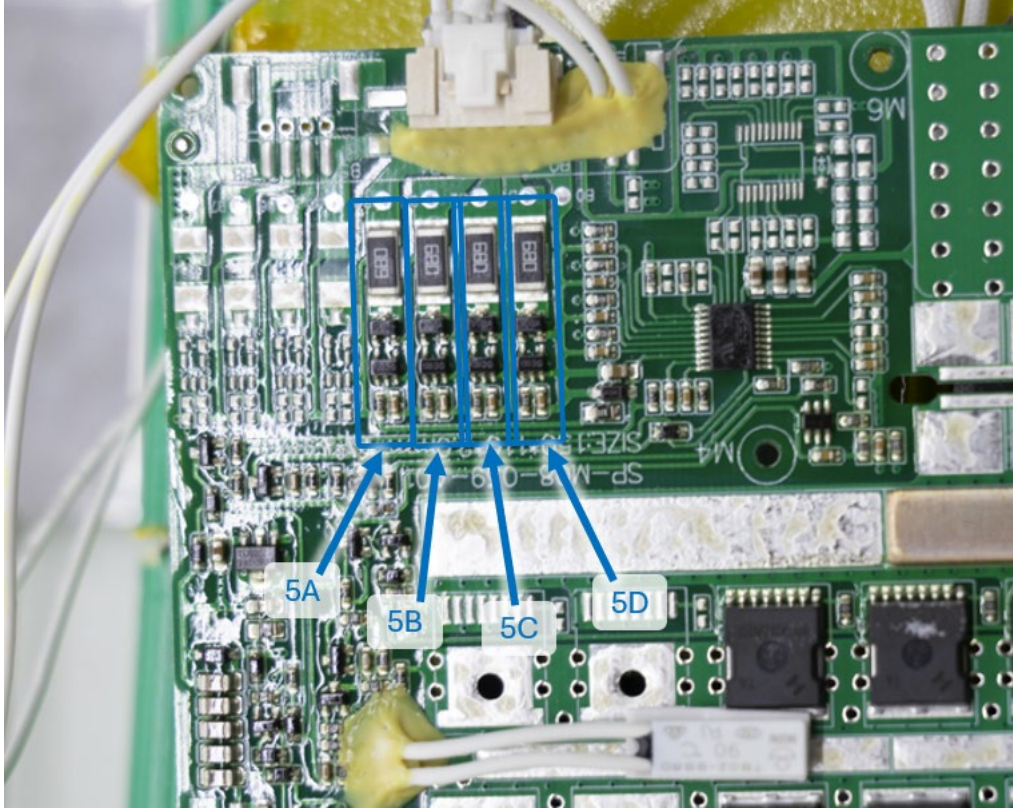
| | |
|-------------------------|---|
| Certifications | UN 38.3 & CE (BATTERY) UL1642 (CELLS) (FILE# MH64443) IEC62133 (CELLS) |
| Shipping Classification | UN 3480, CLASS 9 |

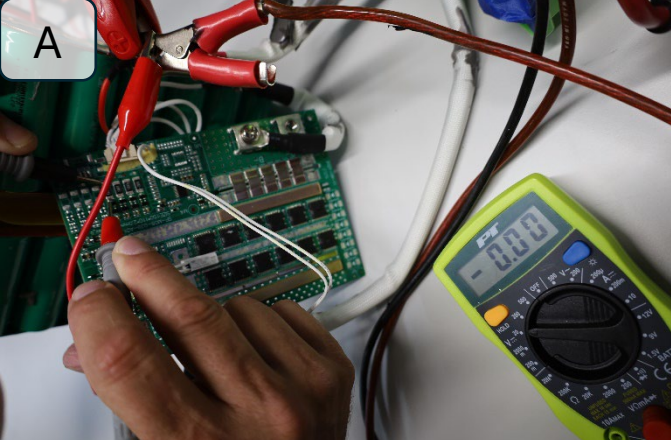
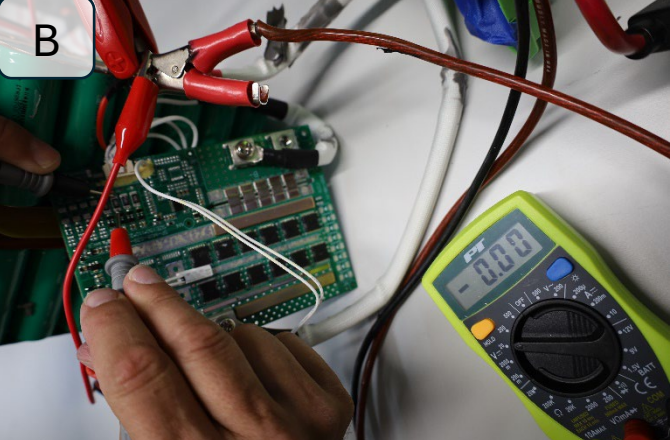
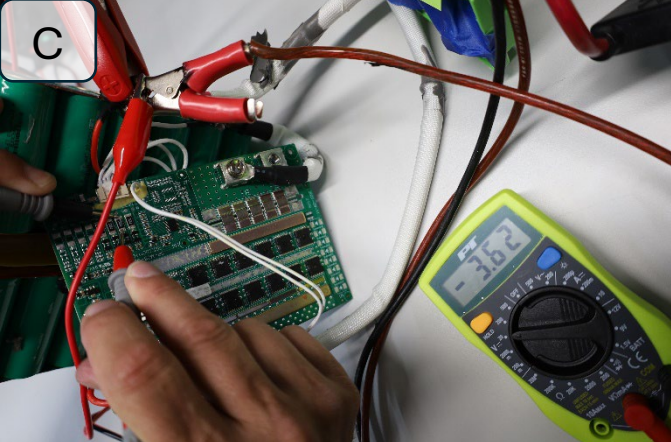
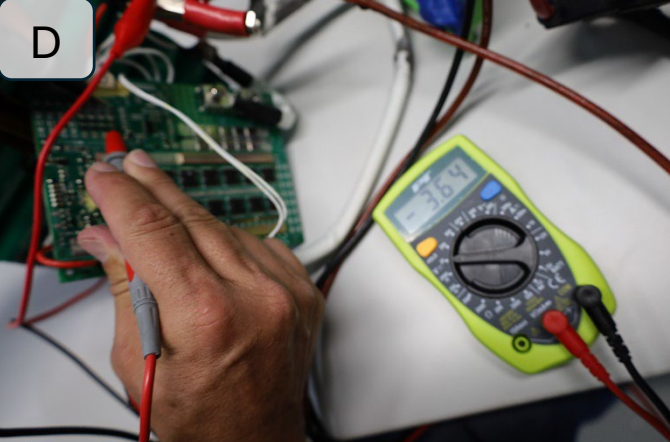
DIMENSIONAL SPECIFICATIONS



https://assets.basspro.com/image/upload/v1684850673/PDFs/other/other_Tracker_Lithium_Gen2_Spec_Sheet.pdf (annotated).

| US9,412,994 Claim Element | Tracker (Tracker Lithium Gen2 12.8V 52AH) |
|---------------------------|--|
| |  <p>A photograph of a Tracker Lithium Gen2 12.8V 52AH battery pack. The battery pack is shown with its internal components, including a green printed circuit board (PCB) and several black lithium-ion cells. A red rectangular box highlights a specific area of the PCB. Within this box, three callouts are present: a red arrow labeled '2' points to a component on the left; a blue arrow labeled '5' points to a component in the center; and an orange arrow labeled '3' points to a component on the right. The battery pack is connected to a yellow cable and a white cable.</p> |

| US9,412,994 Claim Element | Tracker (Tracker Lithium Gen2 12.8V 52AH) |
|---------------------------|--|
| | <div data-bbox="537 139 1543 943"></div> <p data-bbox="537 982 1919 1157">For example, as demonstrated by using a multimeter and testing the voltage across each of the cell balancing circuits 5A-5D when two of the cells were discharged relative to the remaining two cells of the Tracker Lithium Gen2 12.8V 52AH a voltage across the two respective balancing circuits was observed (<i>see</i> photos C and D below) while the remaining two balancing circuits remained inactive (<i>see</i> photos A and B below).</p> |

| US9,412,994 Claim Element | Tracker (Tracker Lithium Gen2 12.8V 52AH) |
|---------------------------|--|
| | <div data-bbox="541 139 1207 576">A</div> <div data-bbox="1218 139 1883 576">B</div> <div data-bbox="541 584 1207 1023">C</div> <div data-bbox="1218 584 1883 1023">D</div> <p data-bbox="541 1063 1883 1136">The Tracker Lithium Gen2 12.8V 52AH comprises a circuit board having a cutoff function incorporated therein.</p> |

US9,412,994 Claim Element

Tracker (Tracker Lithium Gen2 12.8V 52AH)



TLi/WR52-DC Gen2

ELECTRICAL SPECIFICATIONS

| | |
|---------------------------|------------------|
| Nominal Voltage | 12.8V |
| Nominal Capacity | 52Ah |
| Capacity @ 25A | 156 min |
| Resistance | ≤30 mΩ @ 50% SOC |
| Efficiency | 99% |
| Self Discharge | <3% per Month |
| Maximum Modules in Series | 4 |

DISCHARGE SPECIFICATIONS

| | |
|--------------------------------------|------------------------------------|
| Maximum Continuous Discharge Current | 60A |
| Peak Discharge Current | 200A (2s) |
| BMS Discharge Current Cut-Off | 200A ± 50A (2 ± 1 ms) |
| Recommended Low Voltage Disconnect | 10V |
| BMS Discharge Voltage Cut-Off | 9.2V (2.3 ± 0.1 vpc) (2 ± 0.5s) |
| Reconnect Voltage | 10V (2.5 ± 0.1 vpc) (2 ± 0.5s) |
| Short Circuit Protection | 200-800 μA |

TEMPERATURE SPECIFICATIONS

| | |
|------------------------------|-----------------------------|
| Discharge Temperature | -4 to 140 °F (-20 to 60 °C) |
| Charge Temperature | -4 to 113 °F (-20 to 45 °C) |
| Storage Temperature | 23 to 95 °F (-5 to 35 °C) |
| BMS High Temperature Cut-Off | 167 °F (75 °C) |
| Reconnect Temperature | 122 °F (50 °C) |

MECHANICAL SPECIFICATIONS

| | |
|------------------------|---|
| Dimensions (L x W x H) | 7.75 X 5.27 X 6.69" 197 X 134 X 170 MM |
| Weight | 15.7 lbs (7.1 kg) |
| Terminal Type | M8 x 1.25 x 2mm |
| Terminal Torque | 80 - 100 in-lbs (9 - 11 N-m) |
| Case Material | ABS |
| Enclosure Protection | IP67 |
| Cell Type - Chemistry | Cylindrical - LiFePO4 |

CHARGE SPECIFICATIONS

| | |
|---|--|
| Recommended Charge Current | 10A |
| Maximum Charge Current | 50A |
| Charge Current 14 to 32 °F (-10 to 0 °C) | ≤0.03 C |
| Charge Current -4 to 14 °F (-20 to -10 °C) | ≤0.02 C |
| Recommended Charge Voltage | 14.2 V - 14.6 V |
| BMS Charge Voltage Cut-Off | 15V (3.75 ± 0.05 vpc) (1.5 ± 1.0 s) |
| Reconnect Voltage | 14.4V (3.6 ± 0.05 vpc) |
| Balancing Voltage | 14.2V (3.55 ± 0.05 vpc) |

COMPLIANCE SPECIFICATIONS

| | |
|-------------------------|---|
| Certifications | UN 38.3 & CE (BATTERY) UL1642 (CELLS) (FILE# MH64443) IEC62133 (CELLS) |
| Shipping Classification | UN 3480, CLASS 9 |


DIMENSIONAL SPECIFICATIONS



Top View Dimensions: 197.0 (7.75) inches, 134.0 (5.27) inches. Terminal: M8 (M0.31).

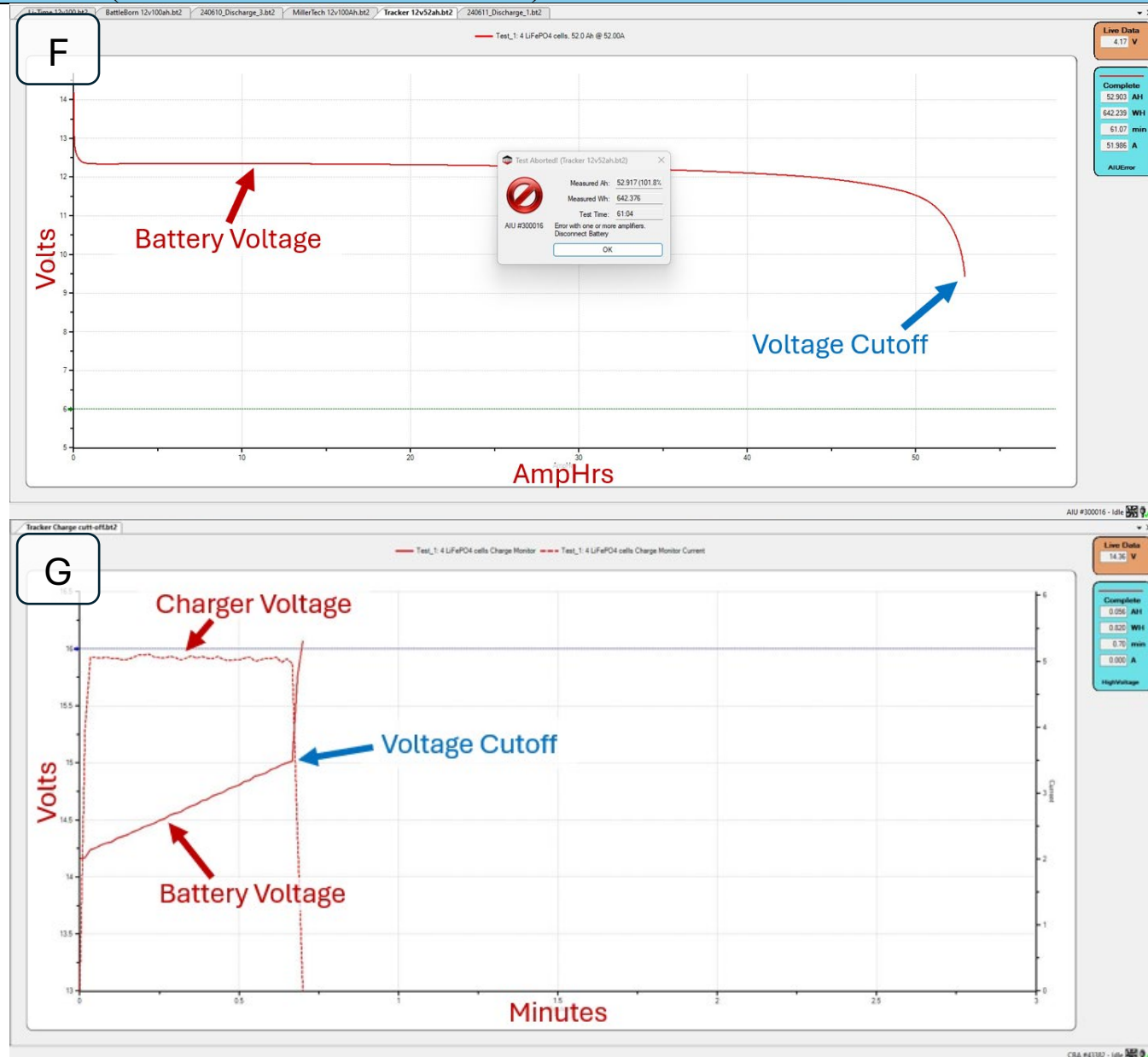
Side View Dimensions: 170.0 (6.69) inches.

https://assets.basspro.com/image/upload/v1684850673/PDFs/other/other_Tracker_Lithium_Gen2_Spec_Sheet.pdf (annotated).

| US9,412,994 Claim Element | Tracker (Tracker Lithium Gen2 12.8V 52AH) |
|---------------------------|--|
| | <p>For example, as demonstrated by connecting the battery terminals of the Tracker Lithium Gen2 12.8V 52AH to a computerized battery analyzer (see photo E below), the cutoff functionality is demonstrated by the termination of electrical current when the Tracker Lithium Gen2 12.8V 52AH was discharged below its rated voltage (see photo F below). Similarly, the cutoff functionality is also demonstrated by the termination of electrical current when the Tracker Lithium Gen2 12.8V 52AH was charged above its rated voltage (see photo G below).</p> <p data-bbox="541 358 636 435">E</p>  |


US9,412,994 Claim Element


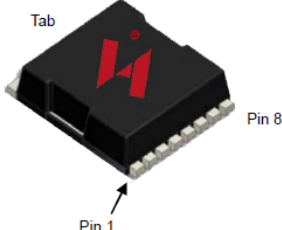
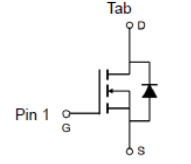
Tracker (Tracker Lithium Gen2 12.8V 52AH)



[1c-ii]

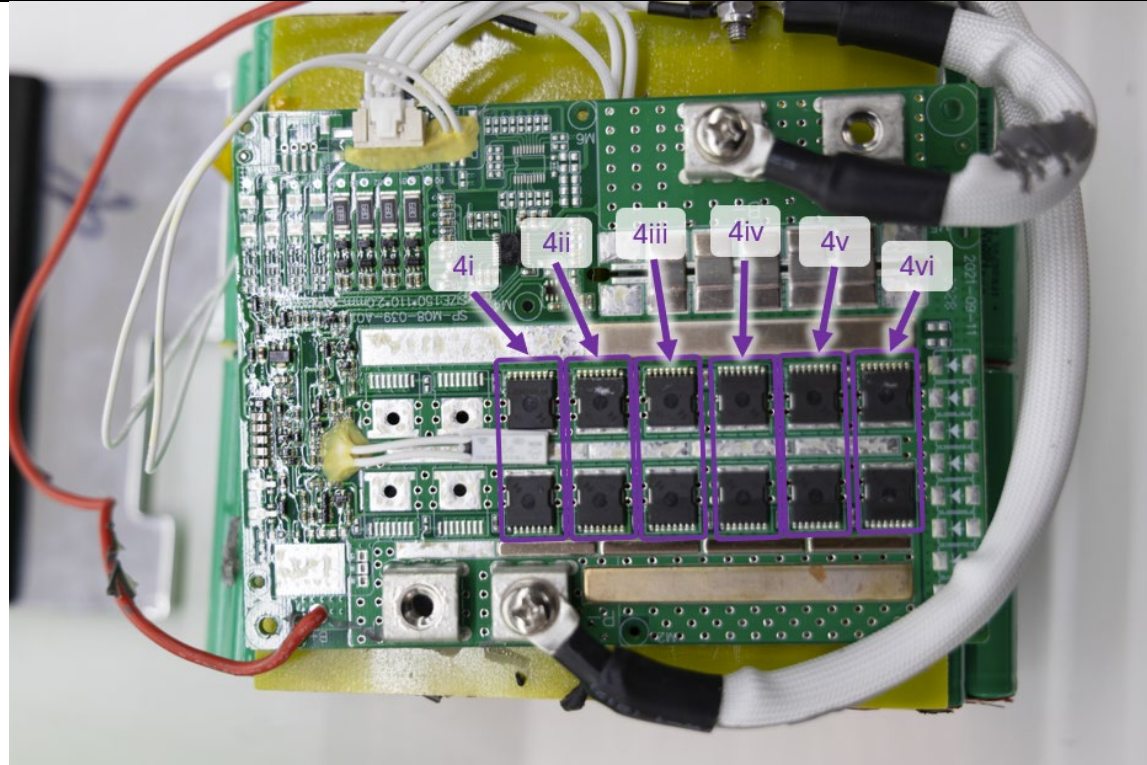
The circuit board of the Tracker Lithium Gen2 12.8V 52AH includes a plurality of pairs of solid state switches.

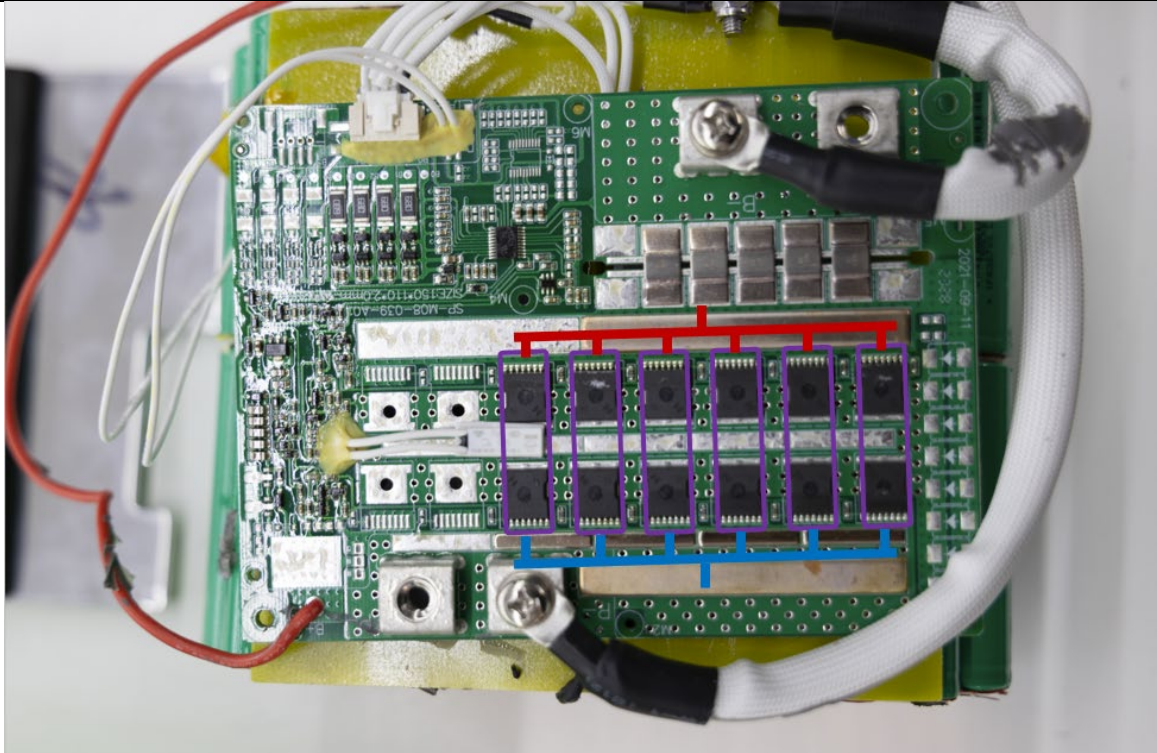
| US9,412,994 Claim Element | Tracker (Tracker Lithium Gen2 12.8V 52AH) |
|--|---|
| <p>said circuit board including a plurality of pairs of solid state switches with each pair of solid state switches connected in a parallel configuration to another pair of solid state switches,</p> |  |


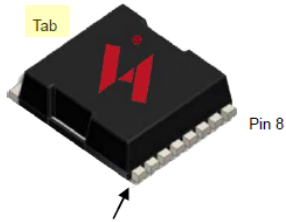
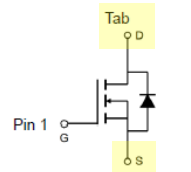
| US9,412,994 Claim Element | Tracker (Tracker Lithium Gen2 12.8V 52AH) |
|---------------------------|---|
| | <div data-bbox="562 142 1537 1026"> <div data-bbox="569 168 861 207">HYG015N10NS1TA</div> <div data-bbox="1339 147 1537 207">  HUAYI Microelectronics </div> <div data-bbox="989 277 1493 310">N-Channel Enhancement Mode MOSFET</div> <div data-bbox="569 358 667 386">Feature</div> <ul data-bbox="569 418 873 613" style="list-style-type: none"> • 100V/380A $R_{DS(on)} = 1.2 \text{ m}\Omega (\text{typ.}) @ V_{GS} = 10\text{V}$ • 100% Avalanche Tested • Reliable and Rugged • Halogen-Free Devices Available (RoHS Compliant) <div data-bbox="1241 358 1451 386">Pin Description</div> <div data-bbox="1220 402 1499 678">  <p>Tab Pin 8 Pin 1 TOLL</p> </div> <div data-bbox="569 753 730 786">Applications</div> <ul data-bbox="569 813 953 906" style="list-style-type: none"> • Switching application • Power management for inverter systems • Battery management <div data-bbox="1268 781 1457 1003">  <p>Tab D Pin 1 G S Pin 2,3,4,5,6,7,8 N-Channel MOSFET</p> </div> </div> <p data-bbox="537 1036 1230 1068">Huayi-HYG015N10NS1TA datasheet.pdf (annotated).</p> <p data-bbox="537 1105 1902 1179">The solid state switches of the Gen2 12.8V 52AH are arranged in pairs (e.g., 4i-4vi) with each pair of solid state switches connected in a parallel configuration to another pair of solid state switches.</p> |

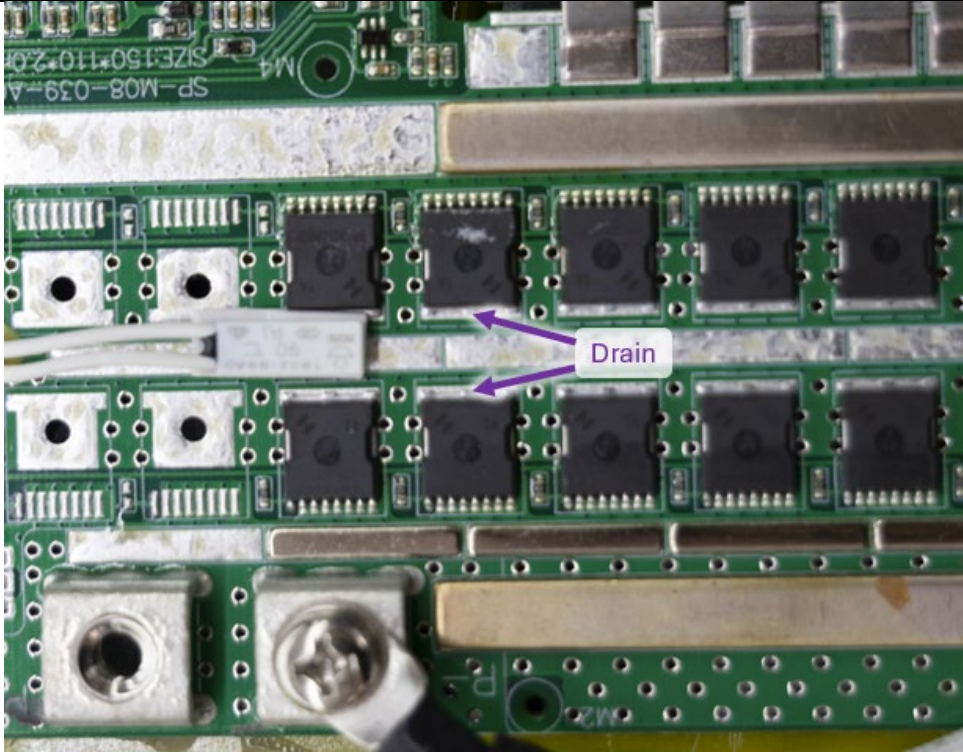
US9,412,994 Claim Element

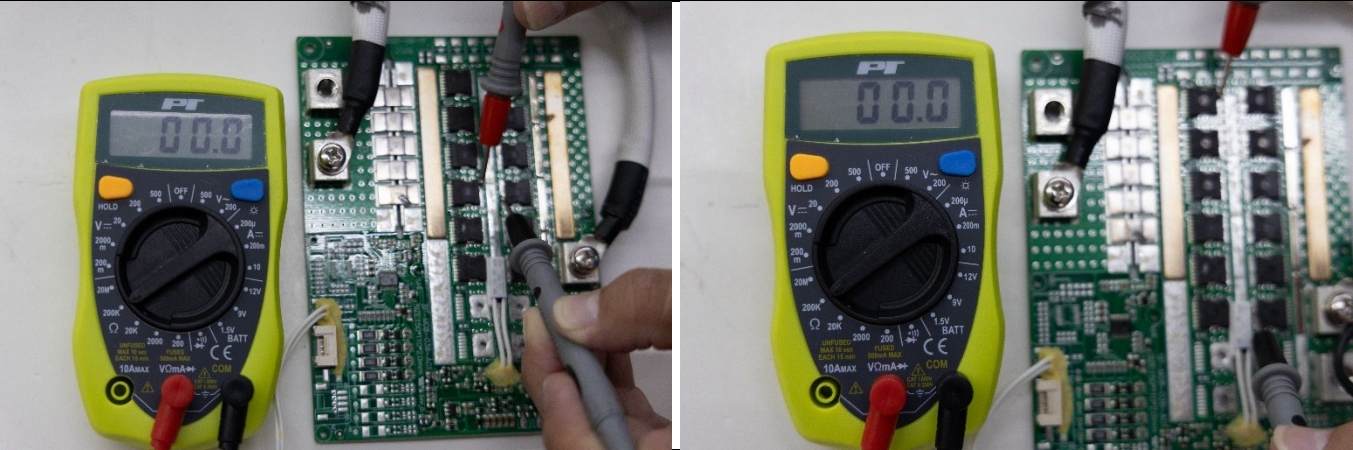
Tracker (Tracker Lithium Gen2 12.8V 52AH)

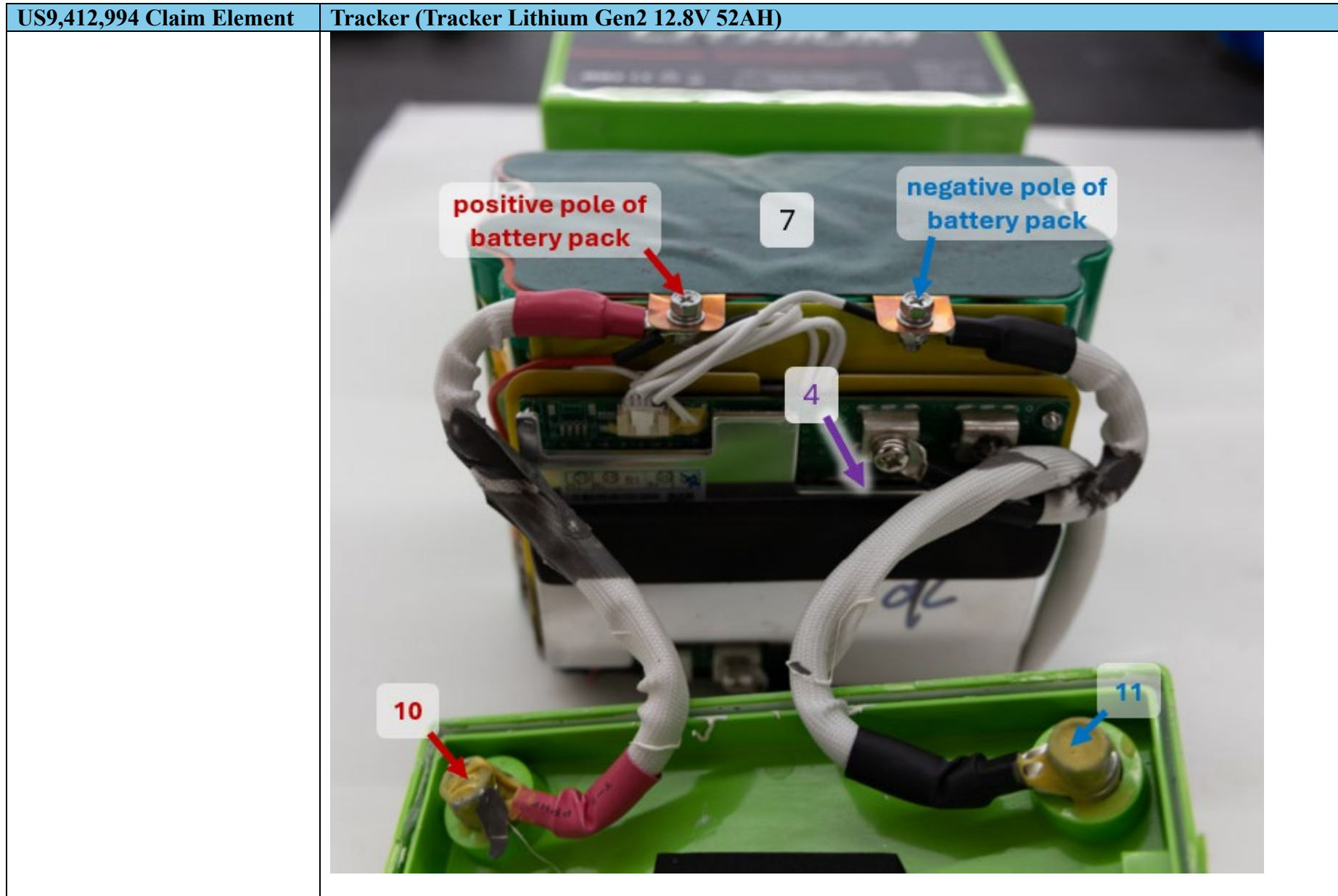


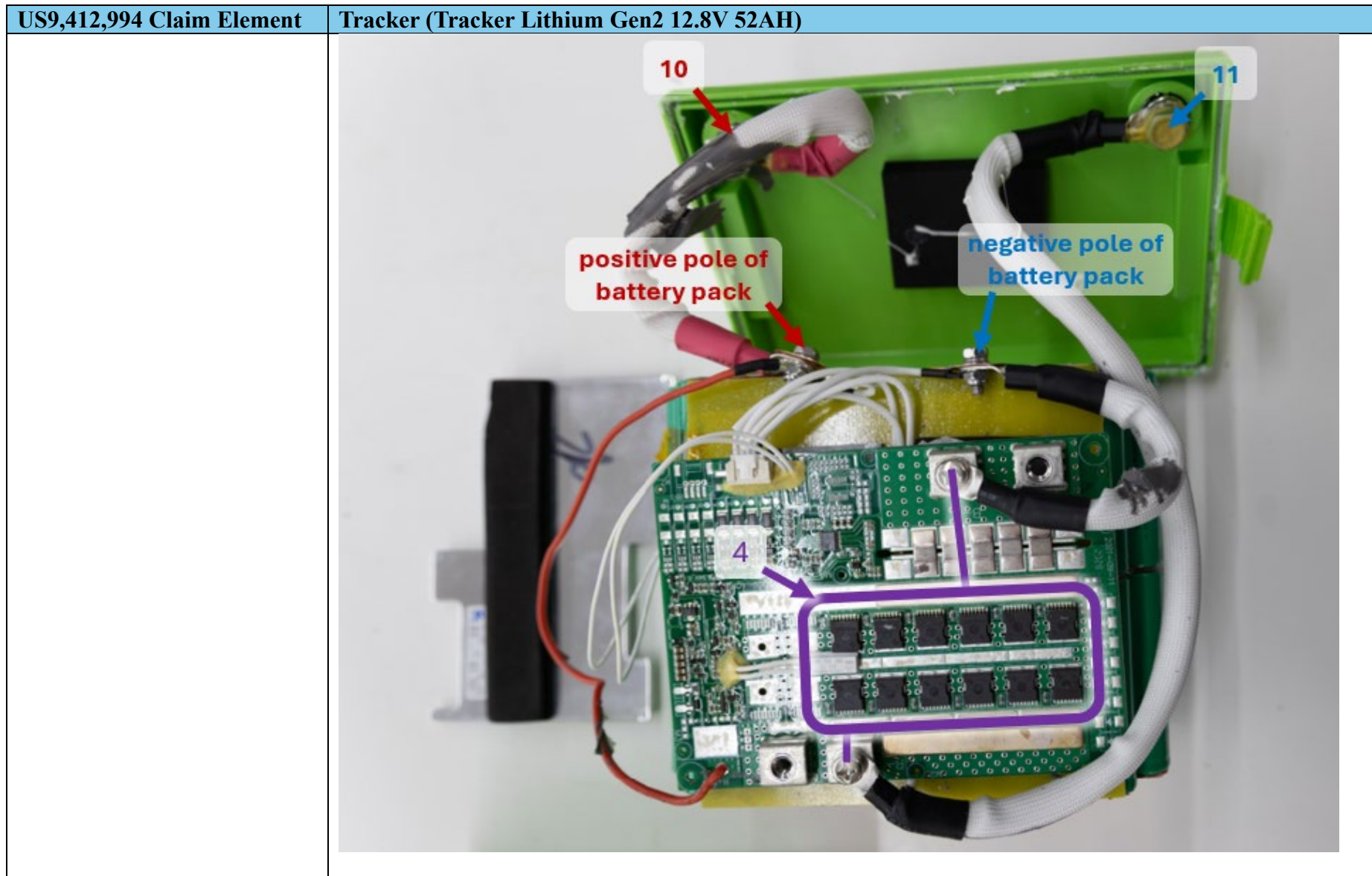
| US9,412,994 Claim Element | Tracker (Tracker Lithium Gen2 12.8V 52AH) |
|--|---|
| |  |
| <p>[1c-iii] each switch having a source and a drain, the switches of a pair of solid state switches being configured such that either the drains of the switches are connected or the sources of the switches are connected; and</p> | <p>Each switch of the Tracker Lithium Gen2 12.8V 52AH has a source (i.e., “S”) and a drain (i.e., “D”).</p> |

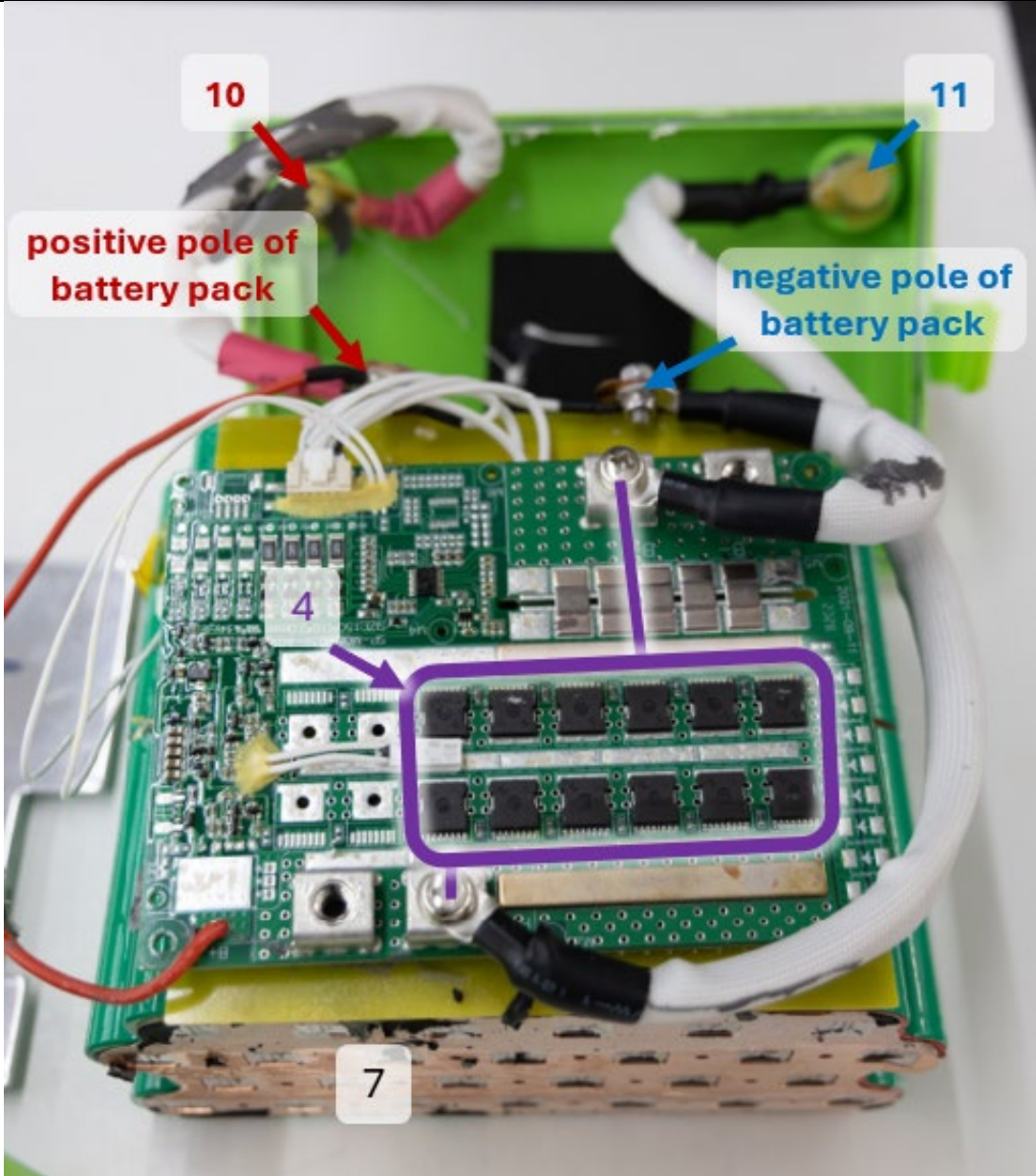
| US9,412,994 Claim Element | Tracker (Tracker Lithium Gen2 12.8V 52AH) |
|---------------------------|--|
| | <div data-bbox="546 138 1554 1031"> <div data-bbox="567 170 861 203">HYG015N10NS1TA</div> <div data-bbox="1344 146 1533 203">  HUAYI Microelectronics </div> <div data-bbox="997 276 1491 308">N-Channel Enhancement Mode MOSFET</div> <div data-bbox="567 357 672 389">Feature</div> <ul data-bbox="567 414 882 617" style="list-style-type: none"> • 100V/380A $R_{DS(on)}=1.2\text{ m}\Omega(\text{typ.})@V_{GS}=10\text{V}$ • 100% Avalanche Tested • Reliable and Rugged • Halogen-Free Devices Available (RoHS Compliant) <div data-bbox="567 755 735 787">Applications</div> <ul data-bbox="567 812 955 909" style="list-style-type: none"> • Switching application • Power management for inverter systems • Battery management <div data-bbox="1249 357 1449 389">Pin Description</div> <div data-bbox="1218 397 1501 682">  <p>Tab</p> <p>Pin 8</p> <p>Pin 1</p> <p>TOLL</p> </div> <div data-bbox="1270 771 1459 1006">  <p>Tab</p> <p>Pin 1</p> <p>Pin 2,3,4,5,6,7,8</p> <p>N-Channel MOSFET</p> </div> </div> |
| | <p data-bbox="535 1031 1228 1063">Huayi-HYG015N10NS1TA datasheet.pdf (annotated).</p> <p data-bbox="535 1104 1848 1172">The switches of a pair of solid state switches of the Tracker Lithium Gen2 12.8V 52AH are configured such that the drains of the switches are connected.</p> |


| US9,412,994 Claim Element | Tracker (Tracker Lithium Gen2 12.8V 52AH) |
|---------------------------|---|
| | <div data-bbox="537 134 1493 881"></div> <p data-bbox="537 922 1848 1023">For example, as demonstrated by testing the electrical continuity using a multimeter, the drains of the switches of the Tracker Lithium Gen2 12.8V 52AH are connected, as shown by the nominal resistance measured between the drains of opposed MOSFETs.</p> |


| US9,412,994 Claim Element | Tracker (Tracker Lithium Gen2 12.8V 52AH) |
|--|---|
| |  |
| <p>[1d] said parallel configuration of the plurality of solid state switches being connected in series with said one or more cells between said positive and negative terminals of the battery pack.</p> | <p>The parallel configuration of the plurality of solid state switches (4) of the Tracker Lithium Gen2 12.8V 52AH are connected in series with the one or more cells (7) between the positive (10) and negative terminals (11) of the battery pack.</p> |






| US9,412,994 Claim Element | Tracker (Tracker Lithium Gen2 12.8V 52AH) |
|---------------------------|--|
| |  <p>The photograph shows the internal components of a Tracker Lithium Gen2 12.8V 52AH battery pack. The main components are labeled with callouts:</p> <ul style="list-style-type: none"> 10: positive pole of battery pack (indicated by a red arrow pointing to a red wire terminal) 11: negative pole of battery pack (indicated by a blue arrow pointing to a blue wire terminal) 4: A purple box highlights a section of the green printed circuit board (PCB) containing several black integrated circuits (chips). 7: A white box highlights the bottom section of the battery pack, showing the copper busbars and the internal structure of the battery cells. |
| Claim 14 | |

| US9,412,994 Claim Element | Tracker (Tracker Lithium Gen2 12.8V 52AH) | | | | | | | | |
|--|--|----------------------|-----------|----------------------|-------------|----------------------|-------------|------------------------|-----------|
| <p>[14p] A battery pack for driving an electrical device in a 1 volt to 120 volt operating system, said battery pack comprising:</p> | <p>To the extent the preamble is limiting, the Tracker Lithium Gen2 12.8V 52AH is a battery pack for driving an electrical device in a 1 volt to 120 volt operating system.</p>  <p>SIZING/SELECTION</p> <p>Q: Will Tracker Lithium batteries work with my Trolling motor? Tracker Lithium deep-cycle batteries 52A and greater are designed to work with all production Trolling Motors. Please consult your specification sheet for larger current drains.</p> <p>Q: What is the minimum quantity of batteries needed for my trolling motor or boat motor?</p> <table border="1"> <tbody> <tr> <td>• 12V trolling motor</td> <td>1 battery</td> </tr> <tr> <td>• 24V trolling motor</td> <td>2 batteries</td> </tr> <tr> <td>• 36V trolling motor</td> <td>3 batteries</td> </tr> <tr> <td>• 12V Starting Battery</td> <td>1 battery</td> </tr> </tbody> </table> <p>Q: Do I need to use the Lithium Starting battery if I purchase Lithium deep-cycle batteries? No, but we recommend the Tracker Lithium starting batteries for extended accessory runtime and faster charging than lead batteries.</p> <p>Q: Can I use different types (Flooded, AGM, Lithium) batteries in my boat for Deep-Cycle applications? Yes, if there is a defective lithium unit, then adding a Flooded or AGM battery short-term in the battery bank will not cause any damage to either setup, but you cannot mix Lithium and Lead in series connections for long-term use. Also, ensure you use the same SKU battery per bank.</p> <p>Q: Can I use different types (Flooded, AGM, Lithium) batteries in starting applications. Yes, adding a flooded or AGM (Lead) battery in parallel can protect the lithium battery and boat components from momentary/defective peak alternator current & voltage.</p> <p><i>Please note: The lead battery should connect to the lithium battery in parallel as a stand-alone battery. Then, install the lithium battery as the main battery with all wires, charger, alternator, starter, etc.... connected to the lithium battery terminals. (See series and parallel diagram on page 2)</i></p> <p>Q: Are my Tracker Lithium batteries drop-in replacements? Yes, Tracker Lithium batteries have physically similar dimensions as Lead and AGM.</p> <p>Deep-Cycle options: The 52A battery is in the U1 size (riding lawnmower size). The 60, 80, and 100 options are all group 24. Starting: The 100A starting battery is a group 31.</p> <p>INSTALLATION</p> <p>Q: How should I install my Tracker Lithium batteries? The battery is a direct replacement and should be installed the same as the existing batteries.</p> <p>INSTALLATION (cont'd)</p> <p>Q: What size cables/wiring do I need to connect the Tracker Lithium batteries? Refer to the Original Equipment Manufacturer's specifications for wire size required to operate your electrical components and motors.</p> <p>CHARGING</p> <p>Q: What charger do you recommend for marine applications? We recommend using a multi-bank charger to ensure each battery is balanced correctly and receives a full charge. Chargers with a lithium charge profile are required; Lead battery chargers may charge the lithium battery, but doing so will harm the lithium cells lifespan. Please consult your Tracker Lithium dealer for approved lithium charger models.</p> <p>Dual Pro and Noco Charging brands with lithium settings are the approved options for Tracker Lithium. There are there brands that state they can "charge" lithium, but there could be functionality concerns, such as not having to the ability to charge a battery that's 100% discharged. We will update this list with additional chargers as they become available.</p> <p>Q: Can I use any charge profile to charge my batteries? No. AGM or Lead charging profiles can charge a lithium battery which is not fully depleted, but it will harm lithium cells and reduce the battery's overall lifespan.</p> <p>Lithium chargers use algorithms that properly balance and charge the lithium cells.</p> <p>Q: Can I charge multiple batteries in series or parallel with a single set of charge leads (single-bank charger)? Yes, but each battery must receive a full charge independently before connecting in series or parallel. It is strongly recommended to use a multi-bank charger to ensure proper charging and wake-up functions.</p> <p>Q: How long does it take for the batteries to be fully charged? The charging time for your batteries depends on the following: the percent discharged, the charger's output current (Amps), and the total capacity of your battery. Typically, a 10A charger will fully charge a depleted 100A battery in 10 hours.</p> <p>Q: Do I need to charge my Tracker Lithium batteries after each use? It is recommended to fully charge your batteries after each use to ensure full capacity for subsequent uses. Storing lithium batteries under 20% charged can damage the cells or BMS which reduces their overall lifespan.</p> | • 12V trolling motor | 1 battery | • 24V trolling motor | 2 batteries | • 36V trolling motor | 3 batteries | • 12V Starting Battery | 1 battery |
| • 12V trolling motor | 1 battery | | | | | | | | |
| • 24V trolling motor | 2 batteries | | | | | | | | |
| • 36V trolling motor | 3 batteries | | | | | | | | |
| • 12V Starting Battery | 1 battery | | | | | | | | |

| US9,412,994 Claim Element | Tracker (Tracker Lithium Gen2 12.8V 52AH) |
|---|---|
| | <p data-bbox="537 141 1911 207">https://assets.basspro.com/image/upload/v1681327624/PDFs/other/other_Tracker_Lithium_Gen2_FAQ_Sheet.pdf (annotated).</p> <div data-bbox="537 243 1875 857">  <p>The left image shows the front of the Tracker Lithium Gen2 12.8V 52AH battery. The battery is green and black. The text on the front includes 'Gen2: 12.8V 52AH', 'BUILT WITH 100% CERTIFIED CLASS A LiFePO₄ LITHIUM CELLS', 'TRACKER LITHIUM', 'SUPER HIGH OUTPUT LITHIUM DEEP CYCLE BATTERY', 'MODEL: TU52-DC', 'GROUP: U1', 'VOLTAGE: 12.8V', 'CAPACITY: 52Ah', 'ENERGY: 665Wh', 'with Precision Waterproofing, Vibration Control & Fire Suppression Technology', 'UN38.3', 'CE', 'Li', and 'LiFePO₄'. A red box highlights '12.8V'.</p> <p>The right image shows the back of the Tracker Lithium Gen2 12.8V 52AH battery. The battery is green and black. The text on the back includes 'Gen2: 12.8V 52AH', 'BUILT WITH 100% CERTIFIED CLASS A LiFePO₄ LITHIUM CELLS', 'TRACKER LITHIUM', 'SUPER HIGH OUTPUT LITHIUM DEEP CYCLE BATTERY', 'MODEL: TU52-DC', 'GROUP: U1', 'VOLTAGE: 12.8V', 'CAPACITY: 52Ah', 'ENERGY: 665Wh', 'with Precision Waterproofing, Vibration Control & Fire Suppression Technology', 'UN38.3', 'CE', 'Li', and 'LiFePO₄'. A red box highlights '52AH'.</p> </div> |
| <p data-bbox="111 865 514 1068">[14a] a battery pack housing having at least first and second mating portions, said housing having a positive terminal and a negative terminal;</p> | <p data-bbox="537 865 1911 932">The Tracker Lithium Gen2 12.8V 52AH includes a battery pack housing (1) having at least first (1A) and second mating portions (1B).</p> |

| US9,412,994 Claim Element | Tracker (Tracker Lithium Gen2 12.8V 52AH) |
|---------------------------|---|
| |  <p>The left photograph shows the closed green battery housing. A red arrow labeled '1' points to the top left corner. A label '1A' points to the top edge, and a label '1B' points to the top of the black label. The black label contains the following text: 'Gen2: 12.8V 52AH', 'BUILT WITH 100% CERTIFIED CLASS A LiFePO₄ LITHIUM CELLS', 'TRACKER LITHIUM', 'SUPER HIGH OUTPUT LITHIUM DEEP CYCLE BATTERY', 'MODEL: TL52-DC', 'GROUP: U1', 'VOLTAGE: 12.8V', 'CAPACITY: 52Ah', 'ENERGY: 665Wh', 'with Precision Waterproofing, Vibration Control & Fire Suppression Technology', and 'UN38.3 CE'. The right photograph shows the open green housing. A red arrow labeled '1B' points to the internal battery pack. A label '1A' points to the positive terminal on the inside of the lid.</p> <p>The housing of the Tracker Lithium Gen2 12.8V 52AH has a positive terminal (10) and a negative terminal (11).</p> |

| US9,412,994 Claim Element | Tracker (Tracker Lithium Gen2 12.8V 52AH) |
|--|---|
| |  |
| <p>[14b] at least one lithium-based rechargeable cell within said housing, said cell having a positive pole and a negative pole;</p> | <p>The Tracker Lithium Gen2 12.8V 52AH includes at least one lithium-based rechargeable cell within said housing.</p> |


| US9,412,994 Claim Element | Tracker (Tracker Lithium Gen2 12.8V 52AH) |
|---------------------------|---|
| |  |

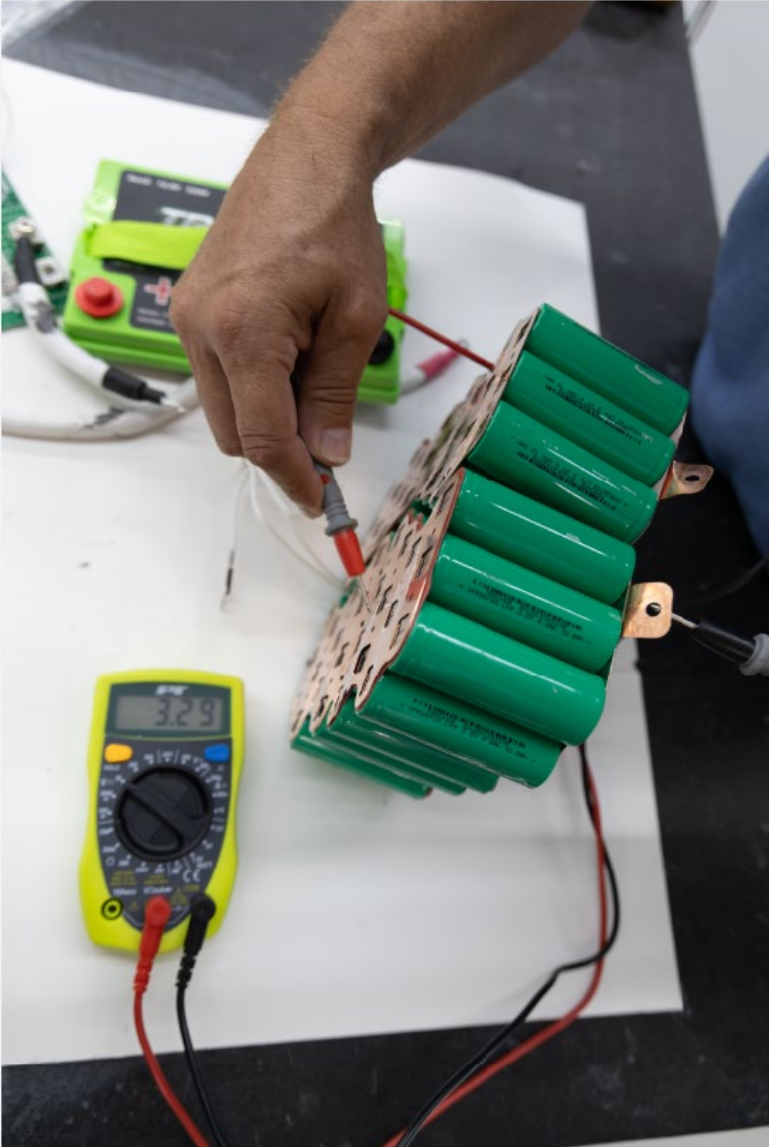
US9,412,994 Claim Element

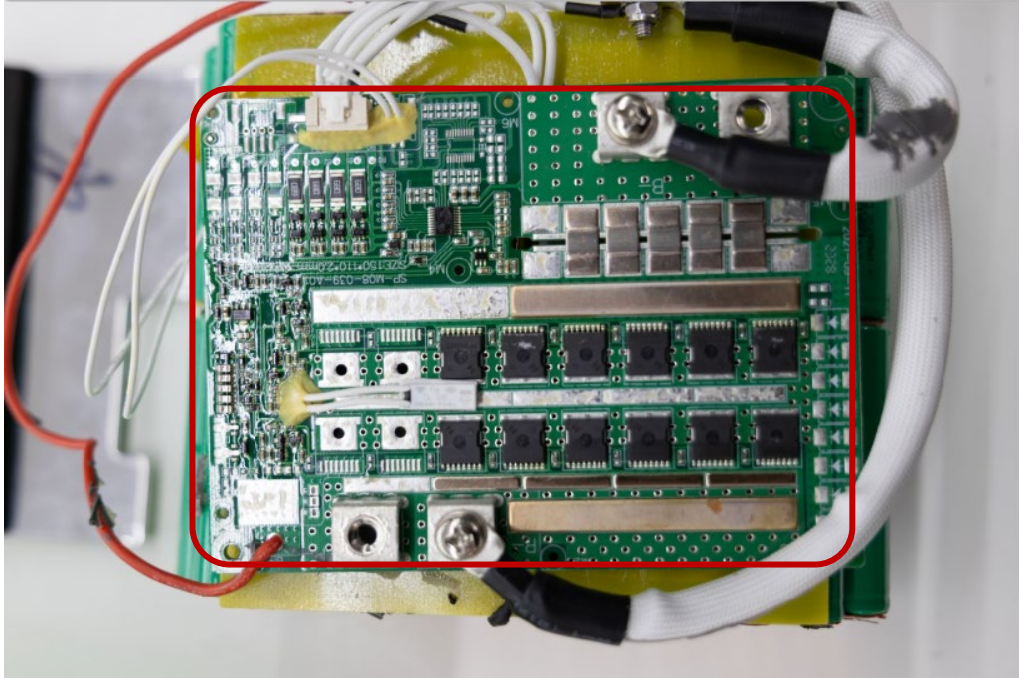
Tracker (Tracker Lithium Gen2 12.8V 52AH)



The at least one lithium-based rechargeable cell of the Tracker Lithium Gen2 12.8V 52AH has a positive pole and a negative pole.

| US9,412,994 Claim Element | Tracker (Tracker Lithium Gen2 12.8V 52AH) |
|---------------------------|--|
| | <div data-bbox="537 134 1549 602"></div> <p data-bbox="537 641 1900 748">Additionally, for example, the polarity of each unit in a cell of the Tracker Lithium Gen2 12.8V 52AH was demonstrated as having a positive pole and a negative pole by using a multimeter to measure a voltage potential across the positive pole and a negative pole of a cell.</p> |

| US9,412,994 Claim Element | Tracker (Tracker Lithium Gen2 12.8V 52AH) |
|---|---|
| |  A photograph showing a person's hand using a red probe to test a circuit board connected to a battery pack. A yellow multimeter is visible on the table, displaying '32.9'. |
| <p>[14c-i] a circuit board within said housing having a cutoff function incorporated therein,</p> | <p>The Tracker Lithium Gen2 12.8V 52AH comprises a circuit board within the housing.</p> |

| US9,412,994 Claim Element | Tracker (Tracker Lithium Gen2 12.8V 52AH) |
|---------------------------|---|
| | <div data-bbox="537 138 1549 812"></div> <p data-bbox="537 852 1869 917">The Tracker Lithium Gen2 12.8V 52AH comprises a circuit board having a cutoff function incorporated therein.</p> |

US9,412,994 Claim Element

Tracker (Tracker Lithium Gen2 12.8V 52AH)



TLi/WR52-DC Gen2

ELECTRICAL SPECIFICATIONS

| | |
|---------------------------|------------------|
| Nominal Voltage | 12.8V |
| Nominal Capacity | 52Ah |
| Capacity @ 25A | 156 min |
| Resistance | ≤30 mΩ @ 50% SOC |
| Efficiency | 99% |
| Self Discharge | <3% per Month |
| Maximum Modules in Series | 4 |

DISCHARGE SPECIFICATIONS

| | |
|--------------------------------------|------------------------------------|
| Maximum Continuous Discharge Current | 60A |
| Peak Discharge Current | 200A (2s) |
| BMS Discharge Current Cut-Off | 200A ± 50A (2 ± 1 ms) |
| Recommended Low Voltage Disconnect | 10V |
| BMS Discharge Voltage Cut-Off | 9.2V (2.3 ± 0.1 vpc) (2 ± 0.5s) |
| Reconnect Voltage | 10V (2.5 ± 0.1 vpc) (2 ± 0.5s) |
| Short Circuit Protection | 200-800 μA |

TEMPERATURE SPECIFICATIONS

| | |
|------------------------------|-----------------------------|
| Discharge Temperature | -4 to 140 °F (-20 to 60 °C) |
| Charge Temperature | -4 to 113 °F (-20 to 45 °C) |
| Storage Temperature | 23 to 95 °F (-5 to 35 °C) |
| BMS High Temperature Cut-Off | 167 °F (75 °C) |
| Reconnect Temperature | 122 °F (50 °C) |

MECHANICAL SPECIFICATIONS

| | |
|------------------------|---|
| Dimensions (L x W x H) | 7.75 X 5.27 X 6.69" 197 X 134 X 170 MM |
| Weight | 15.7 lbs (7.1 kg) |
| Terminal Type | M8 x 1.25 x 2mm |
| Terminal Torque | 80 - 100 in-lbs (9 - 11 N-m) |
| Case Material | ABS |
| Enclosure Protection | IP67 |
| Cell Type - Chemistry | Cylindrical - LiFePO4 |

CHARGE SPECIFICATIONS

| | |
|---|--|
| Recommended Charge Current | 10A |
| Maximum Charge Current | 50A |
| Charge Current 14 to 32 °F (-10 to 0 °C) | ≤0.03 C |
| Charge Current -4 to 14 °F (-20 to -10 °C) | ≤0.02 C |
| Recommended Charge Voltage | 14.2 V - 14.6 V |
| BMS Charge Voltage Cut-Off | 15V (3.75 ± 0.05 vpc) (1.5 ± 1.0 s) |
| Reconnect Voltage | 14.4V (3.6 ± 0.05 vpc) |
| Balancing Voltage | 14.2V (3.55 ± 0.05 vpc) |


COMPLIANCE SPECIFICATIONS

| | |
|-------------------------|---|
| Certifications | UN 38.3 & CE (BATTERY) UL1642 (CELLS) (FILE# MH64443) IEC62133 (CELLS) |
| Shipping Classification | UN 3480, CLASS 9 |

DIMENSIONAL SPECIFICATIONS

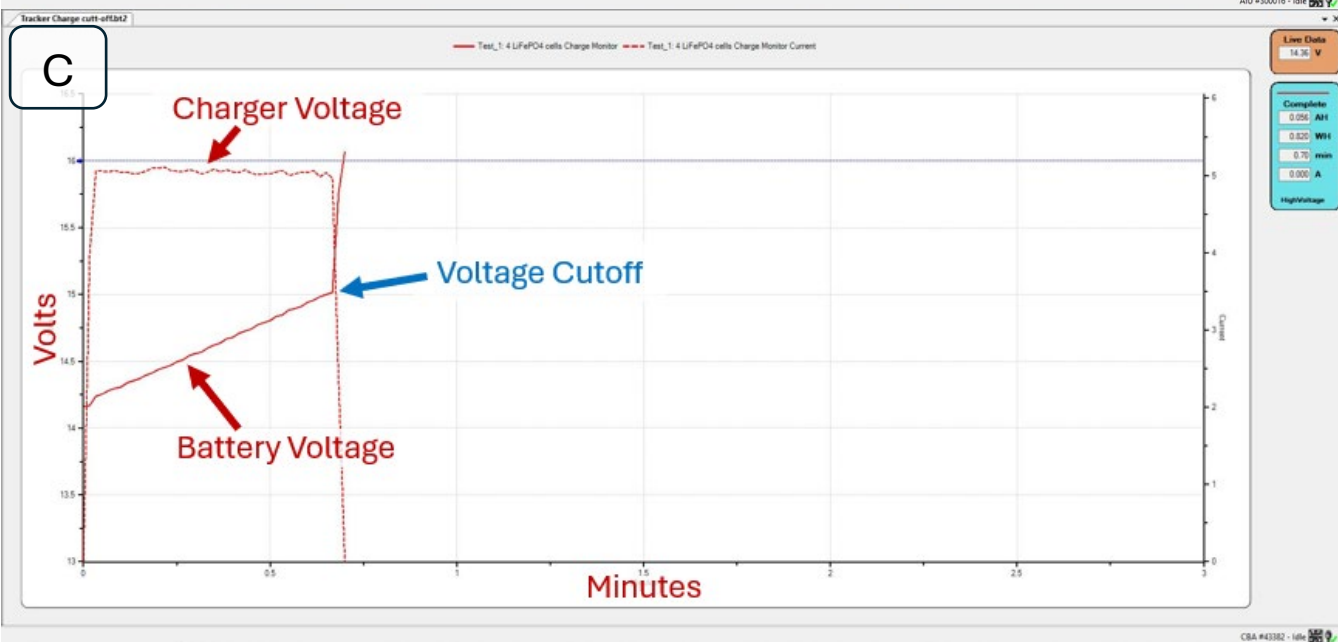
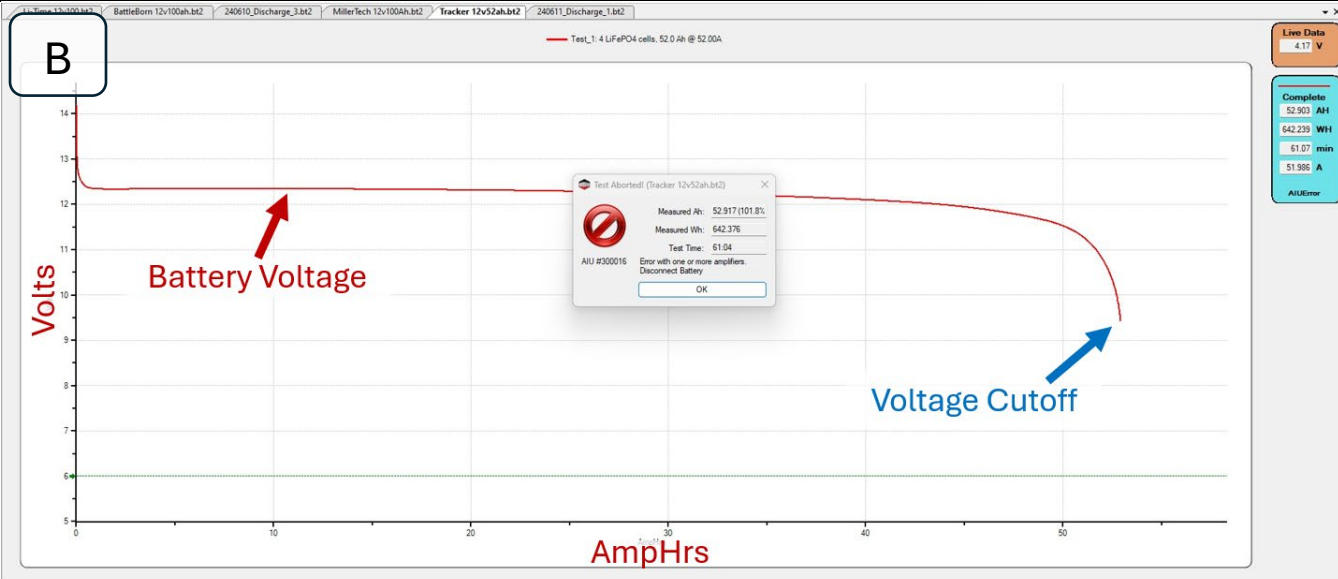



https://assets.basspro.com/image/upload/v1684850673/PDFs/other/other_Tracker_Lithium_Gen2_Spec_Sheet.pdf (annotated).


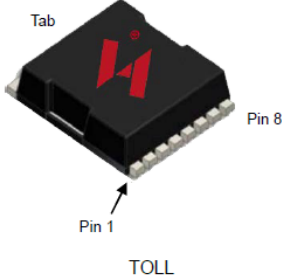
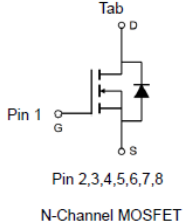
| US9,412,994 Claim Element | Tracker (Tracker Lithium Gen2 12.8V 52AH) |
|---------------------------|--|
| | <p>For example, as demonstrated by connecting the battery terminals of the Tracker Lithium Gen2 12.8V 52AH to a computerized battery analyzer (see photo A below), the cutoff functionality is demonstrated by the termination of electrical current when the Tracker Lithium Gen2 12.8V 52AH was discharged below its rated voltage (see photo B below). Similarly, the cutoff functionality is also demonstrated by the termination of electrical current when the Tracker Lithium Gen2 12.8V 52AH was charged above its rated voltage (see photo C below).</p> <p data-bbox="541 358 636 435">A</p>  |

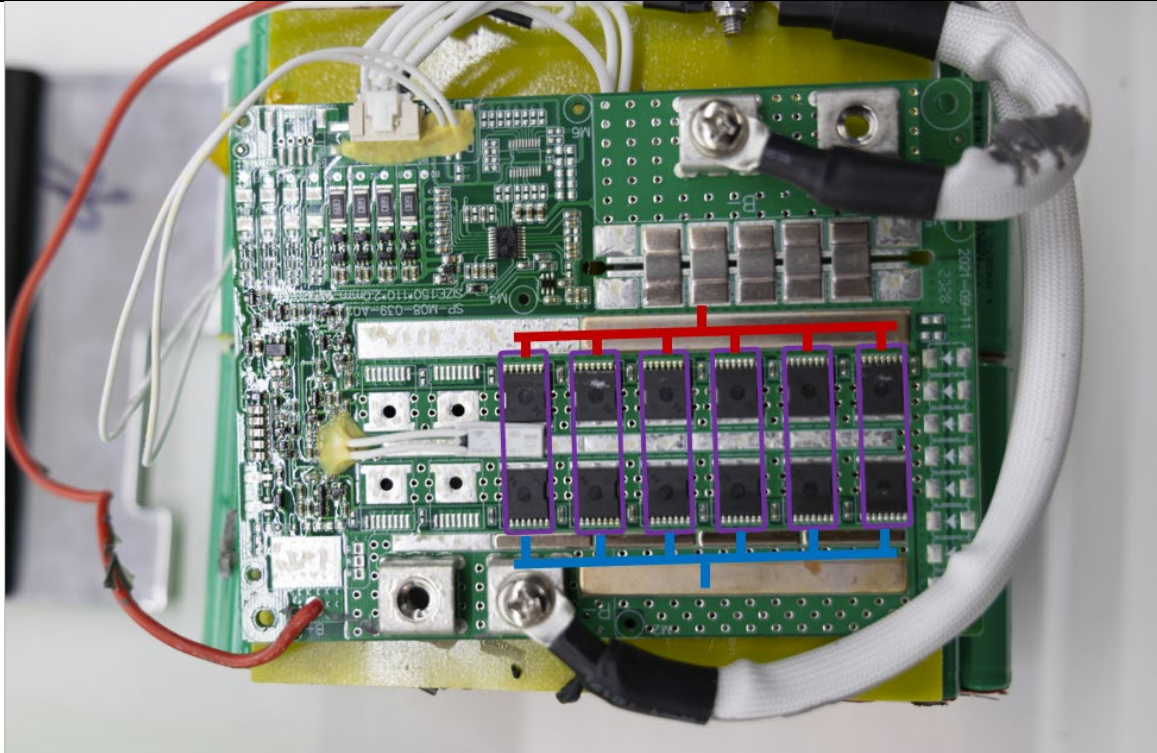
US9,412,994 Claim Element


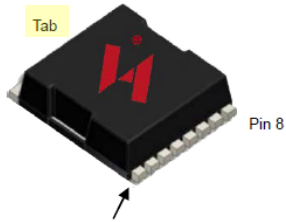
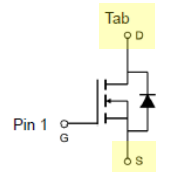
Tracker (Tracker Lithium Gen2 12.8V 52AH)

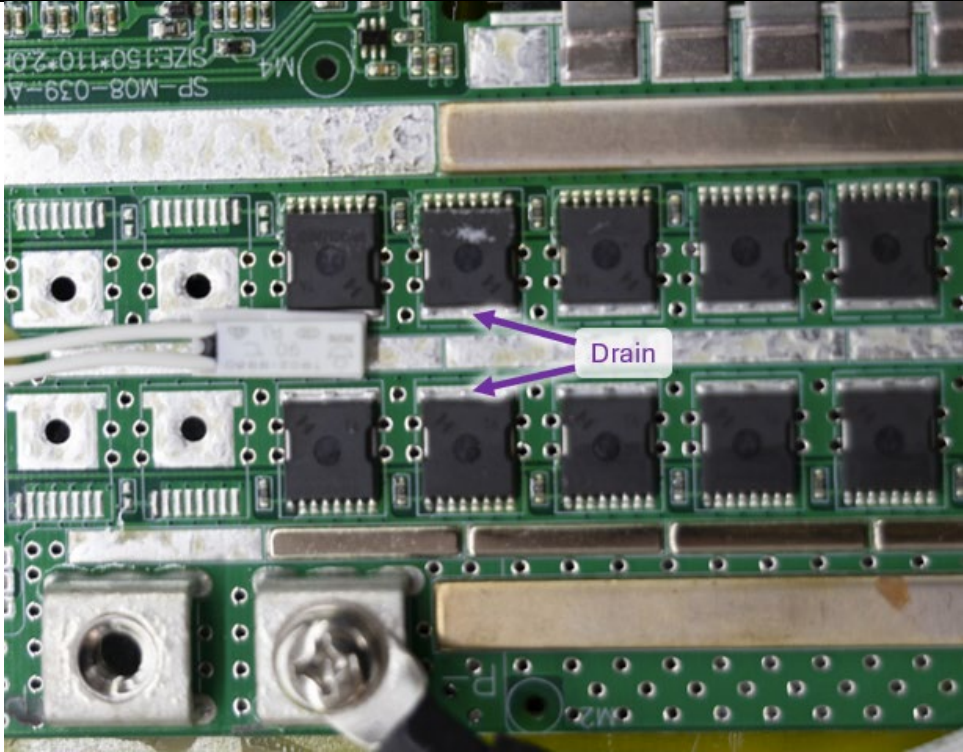


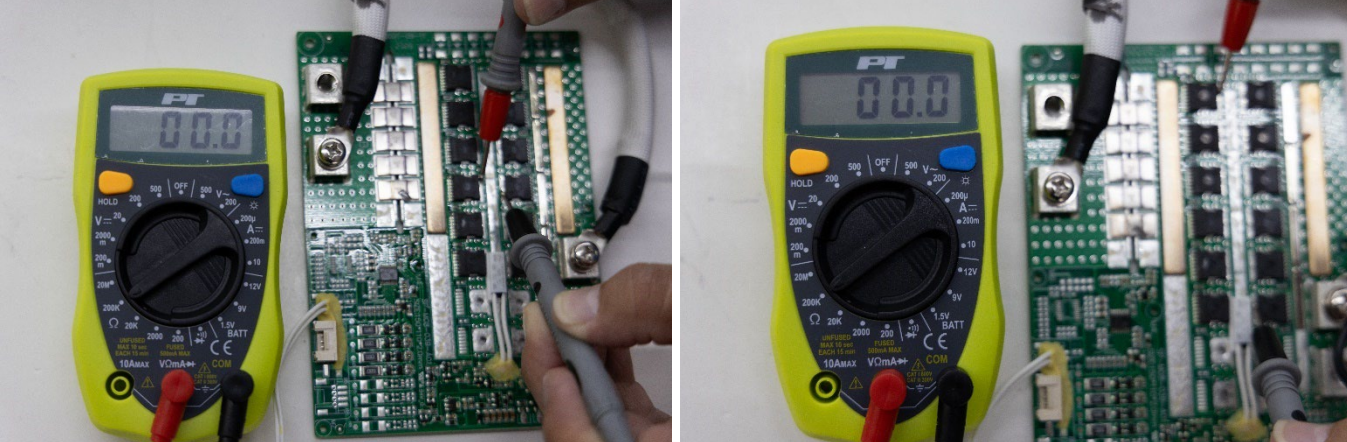
| US9,412,994 Claim Element | Tracker (Tracker Lithium Gen2 12.8V 52AH) |
|---|---|
| <p>[14c-ii] said circuit board including a plurality of pairs of solid state switches with each pair of solid state switches connected in a parallel configuration to another pair of solid state switches,</p> | <p>The circuit board of the Tracker Lithium Gen2 12.8V 52AH includes a plurality of pairs of solid state switches with each pair of solid state switches connected in a parallel configuration to another pair of solid state switches.</p>  |

| US9,412,994 Claim Element | Tracker (Tracker Lithium Gen2 12.8V 52AH) |
|---------------------------|--|
| | <div data-bbox="562 142 1537 1026"> <div data-bbox="569 168 861 207">HYG015N10NS1TA</div> <div data-bbox="1339 147 1537 207">  HUAYI Microelectronics </div> <div data-bbox="989 277 1493 310">N-Channel Enhancement Mode MOSFET</div> <div data-bbox="569 358 667 386"> Feature <ul style="list-style-type: none"> 100V/380A $R_{DS(on)}=1.2\text{ m}\Omega(\text{typ.})@V_{GS}=10\text{V}$ 100% Avalanche Tested Reliable and Rugged Halogen-Free Devices Available (RoHS Compliant) </div> <div data-bbox="1247 358 1451 386"> Pin Description  </div> <div data-bbox="569 753 730 781"> Applications <ul style="list-style-type: none"> Switching application Power management for inverter systems Battery management </div> <div data-bbox="1276 781 1457 1003">  </div> </div> <p data-bbox="537 1036 1230 1068">Huayi-HYG015N10NS1TA datasheet.pdf (annotated).</p> <p data-bbox="537 1105 1877 1175">Each pair of the plurality of pairs of solid state switches (e.g., 4i-4vi) of the Tracker Lithium Gen2 12.8V 52AH are connected in a parallel configuration to another pair of solid state switches.</p> |

| US9,412,994 Claim Element | Tracker (Tracker Lithium Gen2 12.8V 52AH) |
|--|---|
| |  |
| <p>[14c-iii] each switch having a source and a drain, the switches of a pair of solid state switchers being configured such that either the drains of the switches are connected or the sources of the switches are connected; and</p> | <p>Each switch of the Tracker Lithium Gen2 12.8V 52AH has a source (i.e., “S”) and a drain (i.e., “D”).</p> |

| US9,412,994 Claim Element | Tracker (Tracker Lithium Gen2 12.8V 52AH) |
|---------------------------|---|
| | <div data-bbox="546 138 1554 1031"> <div data-bbox="567 170 861 203">HYG015N10NS1TA</div> <div data-bbox="1344 146 1533 203">  HUAYI Microelectronics </div> <div data-bbox="997 276 1491 308">N-Channel Enhancement Mode MOSFET</div> <div data-bbox="567 357 672 389">Feature</div> <ul style="list-style-type: none"> • 100V/380A $R_{DS(on)} = 1.2 \text{ m}\Omega (\text{typ.}) @ V_{GS} = 10\text{V}$ • 100% Avalanche Tested • Reliable and Rugged • Halogen-Free Devices Available (RoHS Compliant) <div data-bbox="1249 357 1449 389">Pin Description</div> <div data-bbox="1218 397 1501 673">  <p>Tab</p> <p>Pin 8</p> <p>Pin 1</p> <p>TOLL</p> </div> <div data-bbox="567 755 735 787">Applications</div> <ul style="list-style-type: none"> • Switching application • Power management for inverter systems • Battery management <div data-bbox="1270 771 1459 1006">  <p>Tab</p> <p>Pin 1</p> <p>Pin 2,3,4,5,6,7,8</p> <p>N-Channel MOSFET</p> </div> </div> <p>Huayi-HYG015N10NS1TA datasheet.pdf (annotated).</p> <p>The switches of a pair of solid state switches of the Tracker Lithium Gen2 12.8V 52AH are configured such that the drains of the switches are connected.</p> |

| US9,412,994 Claim Element | Tracker (Tracker Lithium Gen2 12.8V 52AH) |
|---------------------------|---|
| | <div data-bbox="537 134 1493 881"></div> <p data-bbox="537 922 1848 1015">For example, as demonstrated by testing the electrical continuity using a multimeter, the drains of the switches of the Tracker Lithium Gen2 12.8V 52AH are connected, as shown by the nominal resistance measured between the drains of opposed MOSFETs.</p> |

| US9,412,994 Claim Element | Tracker (Tracker Lithium Gen2 12.8V 52AH) |
|---|--|
| |  |
| <p>[14d] said parallel configuration of the plurality of solid state switches being connected in series with said one or more cells between said positive and negative terminals of the battery pack.</p> | <p>The Tracker Lithium Gen2 12.8V 52AH includes said parallel configuration of the plurality of solid state switches (4) being connected in series with said one or more cells (7) between said positive (10) and negative terminals (11) of the battery pack.</p> |

